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# Returns to Education and Human Capital Depreciation in Spain

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## 1. Introduction

The major technological advances of the last few decades have substantially modified the conditions under which economic activities take place. In the more developed countries, the continuous process of technological change quickly makes the knowledge that workers have acquired obsolescent. There is thus a need for ongoing training programs in order to maintain the effectiveness of the labour force and hence, the competitiveness of the economy -Machin (2001), Machin & Van Reenen (1998), Wolf (2000)-.

From the worker's perspective, the continual changes in the external conditions of the market have major repercussions on his or her decisions concerning ongoing training. Technological progress engenders the increasing complexity of task demanded by jobs in the various sectors and occupations - De Grip & Van Loo (2002)-. There are now both greater educational requirements needed to perform the same tasks as in the past -Falkinger (2002), Borghans & De Grip (2000) - and greater variation in the skills that the market demands -Green *et al.* (2000)-. Workers therefore invest in education as a response not only to the expectation of greater returns associated with a higher educational level but also to the risk of not keeping their skills and knowledge up to date -Gould *et al.* (2001)-.

Many studies have concluded that changes in market conditions particularly affect skilled jobs, which are the object of increased demand to the detriment of less-skilled jobs -see, for example, Piva *et al.* (2005), De Grip & Zwick (2004), Falk & Koebel (2004), Cörvers *et al.* (2002), and Dolado *et al.* (2003)-.

In this context, an issue of especial relevance is whether the obsolescence and depreciation of human capital is greater the higher the worker's education level -Mincer (1974)-. There is no generally accepted opinion on this question. Thus, Holtmann (1972) and Carliner (1982) for instance consider that the worker's educational level is not a significant factor in their depreciation rate, while Mincer & Polachek (1974), Rosen (1976), Neuman & Weiss (1995), Ramírez (2002) and Gould *et al.* (2002) express the contrary opinion.

The main objective of the present paper is to contribute additional information about the link between workers' educational level and the depreciation rate of their human capital, focusing the

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study on the case of the Spanish economy. The few authors who have studied human capital depreciation in Spain have also come to contradictory conclusions. Thus, Arrazola *et al.* (2000) and Arrazola & Hevia (2004) conclude that the depreciation rate does not vary by educational level, while Raymond & Roig (2004) and Murillo (2005) find that depreciation is higher for workers with a higher educational level.

The value added of the present study with respect to previous work lies in two distinct contributions. The first is based on comparing estimations of human capital returns and depreciation for two cross-sectional samples in the case of the Spanish economy, and on using a pseudo-panel of data constructed from the said samples. The second is based on an estimate of wage equations taking into account both sector and occupation. These estimations allow one to calculate the workers' human capital depreciation rates taking into account their occupation and their educational level, and the technological and organizational changes associated with the type of employment.

The remainder of the chapter is organized as follows. Section 2 presents the theoretical framework. Section 3 describes the database used. Section 4 presents the principal results and, finally, Section 5 summarizes the most important conclusions of the study.

## 2. Theoretical framework

According to Neuman & Weiss (1995), one can distinguish two sources of human capital depreciation. On the one hand, the mere passage of time affects individuals' physical and mental abilities (“internal depreciation”) and, on the other, external factors corresponding to changes in market conditions, especially technological change, make the knowledge that individuals have acquired obsolescent (“external depreciation”).

There are two main difficulties involved in estimating human capital depreciation from wage equations in cross-sectional samples. First is the problem of formal identification, and second the differentiation of the two sources giving rise to that depreciation; as Rosen (1975) and Weiss and Lillard (1978) concluded, while the individual's skills decline with age, technological change is also making his or her knowledge obsolescent.

To overcome the first difficulty, the present study takes the methodological approach outlined by Raymond & Roig (2004). Under this approach, and in order to identify the model parameters related to the depreciation rates, one takes an earning equation in which income depends on years of formal education and experience:

$$\log(W_T) = \alpha + \beta_1 KS_T + \beta_2 KE_T \quad (1)$$

where  $W$  represents wages,  $KS$  the human capital deriving from formal education,  $KE$  the human

capital deriving from experience and  $T$  the individuals' experience, assuming that for each individual the number of years of work experience coincides with the number of years since finishing formal education. Lastly, parameters  $\beta_1$  and  $\beta_2$  reflect the productivity associated with schooling and tenure accumulation; as worker productivity determines the salary, these parameters indicate in turn the private returns of human capital.

Both education and experience are assumed to be subject to obsolescence over the course of time. In accordance with this idea, the processes of accumulation of education and experience are modeled as follows. In the case of education:

$$KS_T = S + hTS \quad (2)$$

where  $S$  is the number of years that the individual has invested in education, and  $h$  is the corresponding rate of obsolescence (thus, expecting negative values for it).

In the case of experience, once its rate of obsolescence is incorporated, the expression is:

$$KE_T = \{1 + (T - 1)\gamma\} + \{1 + (T - 2)\gamma\} + \{1 + (T - 3)\gamma\} + \dots + \{1\} \quad (3)$$

where  $\gamma$  is the rate of obsolescence corresponding to experience.

Applying the summation rules for an arithmetic progression, Eq. (3) can be rewritten as

$$KE_T = T + \gamma\{(T - 1) + (T - 2) + (T - 3) + \dots + 1\} = T + \gamma \frac{T^2}{2} \quad (4)$$

Substituting Eqs. (2) and (4) into Eq. (1), one has

$$\log(W) = \alpha + \beta_1 S + \beta_1 h(TS) + \beta_2 T + \frac{\beta_2 \gamma}{2} T^2 = \alpha + \beta_1 S + \pi_1(TS) + \beta_2 T + \pi_2 T^2 \quad (5)$$

where  $\pi_1 = \beta_1 h$  and  $\pi_2 = \frac{\beta_2 \gamma}{2}$ .

After  $T$  periods, the negative effect of the obsolescence of education ( $NES$ ) on the logarithm of the wages will be:

$$NES = \pi_1(TS) \quad (6)$$

while the negative effect of the obsolescence of experience ( $NEE$ ) on the logarithm of the wages will be:

$$NEE = \pi_2 T^2 \quad (7)$$

From expressions (6) and (7), the respective depreciation rates of education and experience are calculated as follows:

- education depreciation rate: percentage effect on wages of an extra year following the end of

$$\text{formal education: } \frac{d(NES)}{dT} = \pi_1 S \quad (8)$$

- experience depreciation rate: percentage effect on wages of an extra year since that

$$\text{experience was acquired: } \frac{d(NEE)}{dT} = 2\pi_2 T \quad (9)$$

In order to differentiate the two sources of human capital depreciation, the method proposed by Neuman & Weiss (1995) is applied, evaluating Eq. (5) by activity sector and by occupation. In particular, it is assumed that the human capital depreciation associated with the passage of time is the same for all workers, regardless of the sector in which they are working or of the job they are performing, while the depreciation due to technological change will be greater the more technology intensive the sector and the more skilled the occupation.

### 3. Description of the sample

The present study uses data taken from the Wage Structure Surveys of 2002 (WSS-02) and 1995 (WSS-95). These surveys contain information concerning Spanish salaried workers and their companies. A series of filters was applied to each data set in order to obtain a homogeneous sample. The resulting final sample consisted of male wage earners working more than 1000 hours annually. Their gross hourly wage rates ranged between 1.5 and 200 euros and they all had completed some level of formal education (excluding vocational training<sup>a</sup>). The number of observations was of 106206 individuals in WSS-95 and 107874 individuals in WSS-02.

The definition of the variables was analogous to that set out in Raymond & Roig (2004). Thus, each individual's schooling ( $S$ ) was approximated by the number of years needed to complete the corresponding educational level. His potential experience ( $T$ ) was calculated as age minus 6 minus years of education and complementary pay for shift work was excluded from his gross hourly wage rate.

The following sectors were considered: mining, manufacturing, trade, hostelry, transport and communications, financial services, business services, utilities (production and distribution of electricity, gas, and water), construction, education, health services, and other social activities (the three last sectors were available only in EES-02, and thus they were not included in the pseudo-panel). Manufacturing firms were classified into four groups according to their technological content following the criteria established by the OECD: low, medium-low, medium-high, and high

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<sup>a</sup> Vocational training has been excluded because its specific characteristics are very different from those of academic education.

technological content. Some of these sectors were aggregated in carrying out the estimates, given the small number of observations available.

Lastly, the occupations were grouped into three categories: first, management level in public administration or companies of more than ten workers, and professions associated with university degrees; second, administrative workers and skilled workers in agriculture and fisheries; and third, unskilled workers in services and labourers in agriculture, fisheries, construction, and manufacturing.

Table 1 shows descriptive statistics about the workers distribution by educational level, by occupation and by sector. As can be seen, there has been an important rise in the percentage of workers with higher education in contrast to the decline in the percentage of workers with low educational attainment. Related to this, the percentage of workers in skilled occupations is higher in the WSS-02 than in the WSS-95.

(Table 1)

## 4. Results

The main results of the study will be presented in two parts. In the first, an analysis is given of whether major changes occurred between 1995 and 2002 in human capital returns and depreciation. And in the second, additional evidence is produced concerning the relationship between workers' educational levels and the depreciation of their human capital.

### 4.1. Temporal estimates

In order to investigate the changes in human capital returns and depreciation between 1995 and 2002, a pool of data was generated from the two samples, and the following equation was estimated:

$$\log(W) = \alpha + \beta_1 S + \pi_1(TS) + \beta_2 T + \pi_2 T^2 + D + D\beta_1 S + D\pi_1(TS) + D\beta_2 T + D\pi_2 T^2 \quad (10)$$

In Eq. (10), the dummy variable (D) is associated with the values of the variables for 2002, and wages are expressed in real terms (2001 euros). Table 2 presents the results of an OLS estimation.

(Table 2)

The results given in Table 2 show a fall in the returns associated with schooling and experience between 1995 and 2002 (by 1.9 and 2.5 percentage points, respectively<sup>b</sup>). A possible

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b. The coefficients estimated for the variables Education\*D and Experience\*D indicate that the returns on education and

reason for this decline could be the increase in the average educational level of the labour force in Spain in this period -Psacharopoulos & Patrinos (2004)-. Despite this result the decision to invest in education is a rational one, mainly due to the high unemployment gap between workers with low and high educational levels in Spain.

With respect to the depreciation of schooling and experience, the figures corresponding to 2002 were lower than those for 1995. In particular, the depreciation of schooling was down 0.34 percentage points in 2002 and depreciation of experience down 2.01 percentage points, as compared to 1995 <sup>c</sup>. One possible explanatory factor in this last result is the lower average age of workers in the 2002 sample.

Figure 1A shows the earnings-experience profiles, distinguished by educational level, for the 2002 sample. The results are as expected. The profiles are higher, with a maximum closer to the origin for the higher educational levels -Neuman & Weiss (1995), Ramírez (2002)-. Also noteworthy is the smaller slope of the profiles for the 2002 sample than for the 1995 sample -Fig. 1B-. The reason is the lower estimated depreciation rates for EES-02. Thus, the differences between the profiles calculated with and without human capital depreciation are greater for the higher educational levels where the depreciation rate is also higher, although less than that estimated using EES-95.

(Figure 1)

Given the above, the question arises as to which part of the evolution observed between 1995 and 2002 is real (*i.e.*, due to modifications in the characteristics of the workers and in the wage levels set by the market), and which part reflects the same behaviour of wages translated over time (cohort effect). This question cannot be answered on the basis of cross-sectional samples, since it requires panel data showing the temporal evolution of the individuals in the sample. Nevertheless, as noted by Deaton (1985), it is possible to generate pseudo-panel data from cohorts of individuals taken from independent cross-sectional surveys that are available for different dates.

Following this reasoning and using EES-95 and EES-02, a pseudo-panel of data was constructed by calculating the averages of the gross wage rates by cohort. The procedure used linked individuals with a 7-year age difference (the time between the two surveys). In particular, the average wage rate of the individuals who were 22 years old in EES-95 were associated with the average wage rate of the individuals who were 29 years old in EES-02, and so on successively until

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experience were 1.9% and 2.5% lower, respectively, for 2002 than for 1995.

c. To calculate these values, the human capital depreciation obtained with the 2002 and 1995 samples on the basis of the values given in Table 2 were subtracted, assigning to each year the corresponding average values of years of education and of experience.



reaching the individuals who were 58 years old in 1995 and were therefore at retirement age in 2002. The average wages were calculated distinguishing the activity sector and the workers' educational level.

This database was used to estimate the following equation:

$$\log(W_{it}) = \alpha_i + \beta_1 E_{it} + \beta_2 E_{it}^2 + \varepsilon_{it} \quad (11)$$

where  $W$  is the gross hourly wage rate in real terms and  $E$  is the age of the worker. Individuals of 65 years in age were eliminated from the sample since in many cases they presented anomalies in the wages they received (possibly due to retirement payments). This left a total of 1739 available observations.

The value added of these estimates with respect to those carried out until now lies in two related aspects corresponding to the structure of panel data used. The first is that a pseudo-panel data set allows one to follow the temporal evolution of the individuals of the sample (as against cross-sectional samples which give their behaviour for a specific time). One can thus consider the changes the individuals undergo in time, as well as controlling their heterogeneity.

With respect to this last aspect, the second advantage of using pseudo-panel data as against the EES cross-sectional samples is the possibility of controlling the unobservable characteristics of the individuals of the sample by fixed effects estimation. As is known, fixed effects estimators correct the bias associated with possible correlation between the explanatory variables and the unobservable characteristics of the individuals, thereby obtaining consistent estimates by means of OLS.

The results of estimating Eq. (11) are useful for calculating the variation in the returns associated with the worker's age (and hence experience) that can be considered as a proxy for the depreciation rate of that experience. The value of this variation is obtained by calculating the difference in returns from the beginning to the end of the individual's working life (16-65 years in age, respectively), weighted by the number of years of active life. In particular:

$$\text{- returns associated with experience: } \frac{d(\log(W_{it}))}{dE} = \beta_1 + 2\beta_2 E_{it} \quad (12)$$

$$\text{- annual variation of the returns on experience: } \frac{[(\beta_1 + 2\beta_2 E_{i65}) - (\beta_1 + 2\beta_2 E_{i16})]}{50} \quad (13).$$

Tables 3-5 present the rates of variation obtained by this procedure. Firstly, one notes that the rates of annual variation in the returns on experience are not homogeneous across the entire sample. Instead, they differ according to educational level, particularly notable being the magnitude

of that variation for the case of workers with a degree.

(Table 3)

Secondly, neither is there homogeneity in the variation of the return on experience by activity sector, particularly notable in this case is that the individuals with the greatest depreciation of experience (greatest annual variation in the returns) are those working in technology intensive sectors. Thus, for example, there was a high annual variation of the returns on experience of financial sector workers, in contrast with the lower variation shown by workers in medium-low technology manufacturing.

(Table 4)

Considering the variation in returns on experience relative to both, educational level and activity sector, one observes that, in general and with certain exceptions, the aforementioned patterns of behaviour are maintained. The annual rates of variation are higher for individuals with progressively higher educational levels, independently of the activity sector. Also, the annual change in the returns on experience is more marked for individuals employed in technology intensive sectors, independently of their educational level.

The greatest differences in rates of variation are between those with the highest educational level and the rest. For example, the annual variation in the returns on experience of an individual working in sectors with a low intensity of technology is on a sliding scale between 0.052% for workers with a basic level of studies, and 0.243% for workers with higher education. These differences are progressively attenuated with the increasing technological content of the company, so that the rates of annual variation of workers employed in technology intensive sectors do not vary substantially according to educational level.

(Table 5)

Lastly, since the pseudo-panel was constructed by calculating the averages of each of its elements from a number of different individual observations (those available in each case), the estimates were repeated including weighting by the square root of the number of observations considered for each mean. This corrects the problem of the heteroskedasticity associated with the unequal numbers of observations corresponding to the above averages. The reasoning followed and the results are given in the Annex.

#### **4.2. Estimates by activity sector and occupation**

Before discussing the results of estimating Eq. (5) distinguishing both activity sector and occupation, the following remarks need to be borne in mind. Since some sectors and occupations

involve specific educational requirements—for example, it is to be expected that managerial positions or jobs in the teaching sector are occupied by workers with university degrees and not those with only primary studies—not all the estimates carried out turn out to be significant. Thus, for example, there are difficulties in segmenting the group of unskilled workers by educational level, with the matrices obtained being almost singular. There are also problems of significance of variables if the sample is segmented by occupation and educational level.

Furthermore, it has to be stressed that the estimates of the wage equations by occupation need to be interpreted with caution, since in fixing the occupational status of a worker (a manager, for example) one is necessarily eliminating one of the sources by which a higher educational level is translated into higher income. The estimated returns on education therefore neglect this source of wage variability.

Table 6 gives the returns associated with education and experience. Two major aspects stand out. One is that these returns are higher, within a given activity sector, the more skilled the job, and, within a given labour category, the more technology intensive the activity sector. The other is that the differences between sectors in the returns on education and experience are greater for the less skilled jobs. These two findings are consistent with those of Ramírez (2002) who finds evidence that the returns on human capital are higher for the more skilled workers, with the differences in returns by sector being more marked for unskilled workers.

(Table 6)

For example, with respect to the first remark, one observes that the returns on education for a manager in a low technology industry are 10%, while for an office worker in this same industry they are 3.4% and for an unskilled worker they are 2.4%. Likewise, the returns on education for a manager vary between 12.6% in the case of firms in the business services sector and 6.5% in the case of firms in the sector of other social activities; and for an office worker they vary between 7.9% in the case of financial services firms and 1.7% in the construction sector. These results lend support to two important arguments. On the one hand, individuals with a higher educational level take advantage of their comparative advantage by seeking employment in sectors and skilled occupations where their higher level of skill comes into play. On the other, not only do workers with a higher educational level seek employment in technologically advanced sectors and skilled posts, but the market also remunerates human capital in sectors and jobs of this type especially well.

With respect to the second remark, the differences between the returns on education by sector are 18.6, 19.6, and 20.44 percentage points for managers, office workers, and labourers, respectively. The differences between the sectoral returns on experience by occupation are generally higher: 13.1, 20.4, and 27.1 percentage points for managers, office workers, and

labourers, respectively<sup>d</sup>.

Table 7 lists the results for the education and experience depreciation rates. They suggest two fundamental ideas. First, the depreciation rates are higher for managers than for office workers, independently of the sector's technological content, and they are null for the labourer and unskilled worker group. These results lend support to the idea that human capital depreciation and workers' educational level are not independent, even when one controls for the technological intensity of the activity sector in which they are employed.

(Table 7)

Secondly, the comparison of depreciation rates between sectors for each occupation on the one hand, and between occupations for each sector, on the other, highlights some interesting results. Thus, the differences in depreciation rates between sectors within each occupation are only slight for the managerial group, and are greater for the less skilled jobs. This result is consistent with the hypothesis that human capital depreciation varies relative to educational level, as some authors have suggested. Given that most managers have degrees, they form a very homogeneous group such that one would not expect any great differences in depreciation rates. The differences in depreciation rates are far greater amongst office workers who form a more heterogeneous group in terms of educational level.

Comparing depreciation rates between occupations within each sector, one observes that the differences between managers and office workers are greater in technology intensive sectors than in sectors that are not very advanced technologically. This finding reinforces the validity of the argument used by Neuman & Weiss (1995) for disentangling the two sources of human capital depreciation -greater technological intensity, faster depreciation, with the depreciation being more marked the more skilled the job-. It is also in line with the results obtained by Ramírez (2002), who noted that the human capital depreciation rate is greater for workers with a higher educational level in both high and low technological content companies, with the differences relative to educational level being more marked in technologically advanced industries.

Figure 2 shows the income profiles with respect to experience, distinguishing occupation and educational level. One observes that, in line with the results commented on above, the income profiles are higher and steeper for individuals in skilled jobs and for individuals with a high educational level. Thus, the income profile corresponding to a manager is higher and steeper than

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d. To calculate these differences, the average value was taken of the returns within each group. Thus, for the managerial group for example, the sum was taken of the absolute values of the differences in returns by sector with respect to the average returns of managers.

that of other workers with less skilled jobs, with this characteristic holding for workers with higher, intermediate, or basic education. Likewise, the income profile of a worker with higher education is also higher and steeper than that of a worker with intermediate or basic education, independently of the job. One therefore deduces that the maximum income will be reached earlier for workers with a high formal education level and for workers doing skilled jobs.

(Figure 2)

## 5. Conclusions

Although economists have in recent years shown growing interest in studying human capital depreciation, there have been few works treating the issue even in the international context. The most commonly studied aspect has been the effect that leaving the labour market has on the stock of human capital and on workers' wages. The present study has approached the analysis of the depreciation of human capital from a different perspective. Its principal objective has been to contribute evidence relating to the question of whether individuals' educational level is an important factor in depreciation rates.

In the first part of the study, wage equations were estimated to determine whether there had been major changes between 1995 and 2002 in the returns on education and in human capital depreciation. It was found that the workers of the 2002 sample had, on average, a higher level of academic education than those of 1995. The new Law of Education (LOGSE) which came into force in 1997 may have been one of the factors behind this rise in educational level since it lengthened the period of compulsory schooling. The progressive incorporation of younger people, with higher educational levels, into the Spanish labour market may be another factor. Also, the higher educational level of the 2002 sample of workers may have been the reason why the returns on human capital were lower than for the 1995 sample.

In the second part of the study, wage equations were estimated taking into account both sector and occupation, in order to determine workers' human capital depreciation rates in terms of their job and educational level and of the technological and organizational changes associated with those jobs. The results indicated that the worker' educational level is an important factor affecting depreciation rates, with the rate being greater the higher the level of academic education.

Authors who have dealt with the subject of human capital depreciation have made various recommendations concerning economic policy measures. They all concur in indicating the importance of dealing with the ongoing training of workers as a necessary means of adapting to new market conditions and maintaining the economy's competitiveness.

In my opinion, this recommendation takes on especial importance in a country such as Spain, with an advanced average age of the work force. This type of measure could contribute to reducing the use of early retirement. Promotion of the ongoing training of workers, enabling them to adapt to technological and organizational innovation, would reinforce the value of the work force since, as was observed by Weinberg (2005), technological innovation favours not only workers with a higher educational level but also those with greater work experience.

Another possible recommendation that emerges from the results concerns the type of teaching (general or specific) given in the classroom -Allen & van der Velden (2002)-. The present paper found evidence that the most advanced sectors technologically are those that best remunerate their employees' human capital, independently of their job. This suggests that technical courses would be the most advantageous for the productivity of the work force. It is in these sectors, however, that human capital depreciates fastest: a further reason for the need to keep workers' skills and knowledge up to date.

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**Annex: Estimations weighted by the number of observations contained in the pseudo-panel averages.**

The pseudo-panel was constructed by calculating the averages of each element from different numbers of individual observations. Equation 11 was therefore estimated including as weighted factor the square root of the number of observations considered for each average. The reasoning behind this procedure is the following.

Each value in the pseudo-panel is obtained by aggregating a set of observations of common characteristics (in this case, age), so that the error term in Equation (11) takes the form:

$$u_i = \frac{1}{n_i}(e_1 + e_2 + \dots + e_{n_i}) \quad (\text{A.1})$$

where  $n_i$  is the number of observations used to calculate value  $i$  of the pseudo-panel. The variance of  $u_i$  will therefore be:

$$\text{var}(u_i) = \frac{1}{n_i^2} n_i \sigma_e^2 = \frac{\sigma_e^2}{n_i} \quad (\text{A.2})$$

where  $\sigma_e^2$  is the variance of  $e$ .

The variance of  $u_i$  depends on  $n_i$ , so that there is a problem of heteroskedasticity. To correct for this, it is sufficient to multiply the estimated equation by the squared root of  $n_i$ , so that



the variance of the new error term ( $u_i^*$ ) will be independent of  $n_i$  :

$$\text{var}(u_i^*) = n_i \text{var}(u_i) = n_i \frac{\sigma_e^2}{n_i} = \sigma_e^2 \quad (\text{A.3})$$

The results, given in tables 1A to 3A, are in general in line with those obtained by estimating the unweighted Equation 11. In some cases, however, the estimations present problems of significance of some independent variables. This could be due to the weighting procedure itself, since one is using the same factor to multiply one logarithmic variable, two variables in levels and one variable in squared.

**Table 1. Sample characteristics**

	WWS-95	WWS-02
Hourly gross wage (2001 euros)	8.31 (5.8)	12.59 (9.1)
Hours worked per week	1769.58(70.9)	1745.85 (93.4)
Educational attainment (%)		
Basic	32.37	25.93
Medium	43.60	38.70
Higher	10.96	19.23
Vocational training	13.07	16.80
Occupation (%)		
Unskilled workers	12.04	13.03
Office workers	67.92	58.87
Managements	20.04	28.10
Sector (%)		
Low intensive technology and mining	22.29	24.26
Medium-low intensive technology	15.37	15.31
Medium-high or high intensive technology	13.60	16.11
Production and distribution of energy	3.03	3.21
Construction and hostelry	17.04	13.71
Trade	8.08	7.79
Transports and communications	7.70	6.72
Financial and bussiness services	12.91	12.89

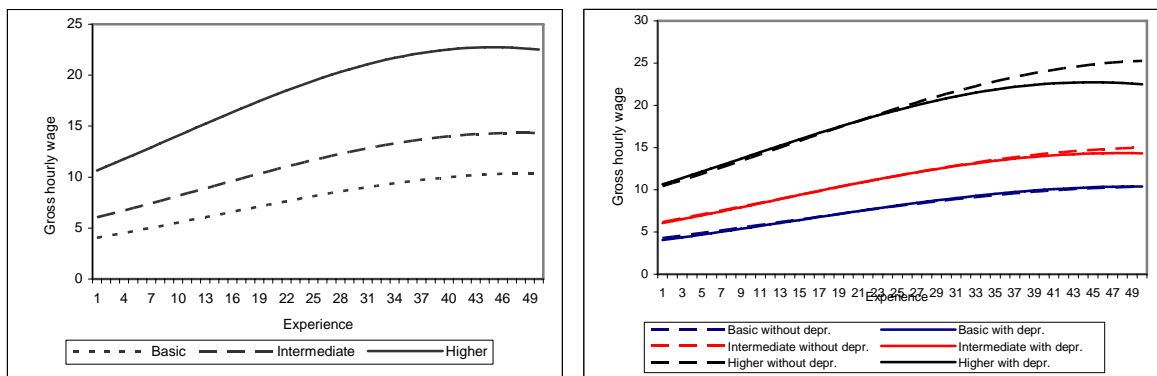
**Table 2. Earnings equation. Pool data (1995 and 2002)**

Dependent variable : log of gross hourly wage

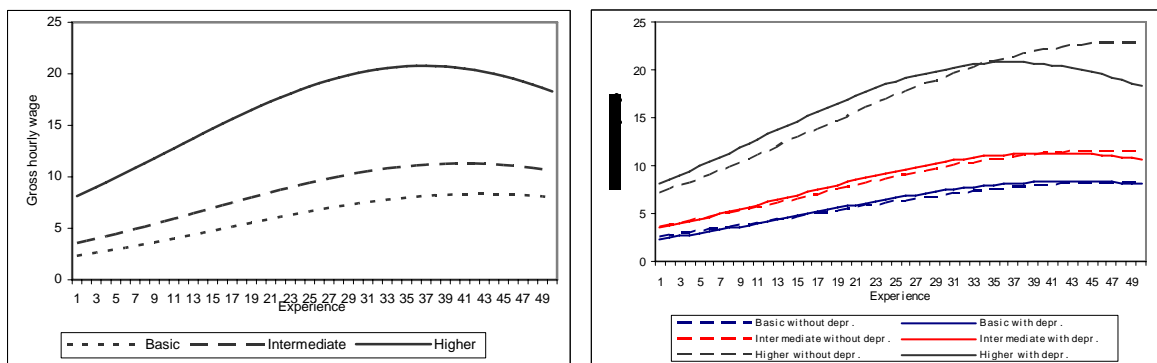
Variables	Coefficients	t- statistics
Constant	0.085103	7.23
Schooling	0.109291	122.70
Schooling*Experience	-0.000874	-23.15
Experience	0.067041	93.24
Experience <sup>2</sup>	-0.000730	-74.56
D	0.771480	47.52
Schooling*D	-0.019373	-16.21
Schooling*Experience *D	0.000512	9.72
Experience*D	-0.025792	-25.27
Experience <sup>2</sup> *D	0.000340	24.96
Fitted R <sup>2</sup>		0.4557
Standard Deviation		0.4162
F		20201.91
N		217114

**Figure 1. Earnings-experience profiles by education level**

A. 2002 sample



B. 1995 sample



**Table 3. Annual variation of the experience returns by educational level (%)**

Educational level	Rate of variation
Basic	0.093
Intermediate	0.141
Higher	0.264
Total	0.164

**Table 4. Annual variation of the experience returns by sector (%)**

Sectors	Rate of variation
Low intensity technology and extractive	0.093
Medium-low intensity technology	0.110
Medium-high or high intensity technology	0.144
Production and distribution of energy	0.172
Construction and hostelry	0.155
Trade	0.172
Transports and communications	0.168
Financial services	0.245
Total	0.164

**Table 5. Annual variation of the experience returns by educational level and sector (%)**

	Rate of variation
Basic, low technology	0.052
Basic, medium technology	0.060
Basic, high technology	0.207
Medium, low technology	0.120
Medium, medium technology	0.130
Medium, high technology	0.189
Higher, low technology	0.243
Higher, medium technology	0.302
Higher, high technology	0.235
Total	0.164

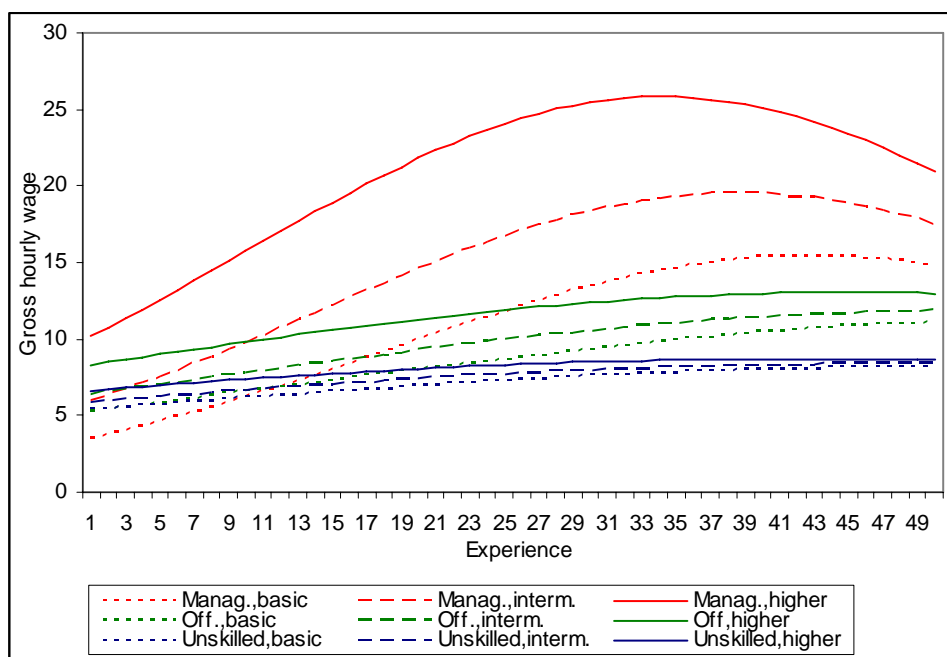
**Table 6. Returns to education by sector, for different occupational categories**

Sectors	Mangements and professions associated with higher university degrees		Office workers and skilled workers in farming and fishing		Manual workers and unskilled workers in services	
	Schooling	Experience	Schooling	Experience	Schooling	Experience
Low intensity technology and mining	10.0	7.3	3.4	3.2	2.4	2.3
Medium-low intensity technology	10.1	7.5	3.3	2.2	2.0	0.4
High or medium-high intensity technology	10.8	8.0	4.5	3.2	0.5	-0.1
Production and distribution of energy	7.4	7.7	6.4	5.4	6.2	4.4
Construction	11.4	9.0	1.7	1.3	2.1	1.5
Trade	11.6	7.9	6.4	4.1	2.7	2.9
Hostelery	8.9	7.7	3.0	2.3	4.1	2.8
Transports and communications	11.0	6.8	5.0	3.7	1.4	1.2
Financial servicies	8.2	8.2	7.9	8.6	5.1	13.1
Bussines services	12.6	9.4	2.4	2.0	3.0	2.5
Education and sanitary services	8.1	4.1	5.5	6.4	9.0	5.7
Other social activities	6.5	4.5	6.5	5.6	1.9	3.6
Total	9.9	8.0	4.4	3.0	2.1	1.8

**Table 7. Depreciation rates by sector, for different occupational categories**

Sectors	Managements and professions associated with higher educational degrees		Office workers and skilled workers in farming and fisheries		Manual workers and unskilled workers in services	
	Schooling	Experience	Schooling	Experience	Schooling	Experience
Low intensity technology and mining	1.43	3.36	0.59	1.46	0.44	0.93
Medium-low intensity technology	1.37	3.46	0.49	0.53	0.27	0.02
High or medium-high intensity technology	1.84	3.37	0.77	1.10	0.59	0.43
Production and distribution of energy	1.43	4.30	0.53	3.27	0.75	2.18
Construction	2.74	3.26	0.00	0.54	0.55	0.53
Trade	1.97	3.34	0.89	1.54	0.96	0.79
Hostelery	1.77	3.86	0.13	0.92	0.42	1.37
Transports and communications	1.55	2.89	0.83	1.69	0.60	0.79
Financial services	1.87	3.88	2.40	4.14	0.79	12.11
Business services	2.37	2.98	0.73	0.02	0.94	0.99
Education and sanitary services	0.00	2.07	2.20	2.98	1.69	2.46
Other social activities	0.35	2.18	1.35	2.71	0.73	1.92
Total	1.92	3.40	0.51	1.16	0.26	0.65

**Figure 2. Earnings-experience profiles by occupational levels and by education**



**Table 1A. Annual variation of the experience returns by educational level (%)**

	Unweighted rates	Weighted rates
Basic	0.093	0.052
Medium	0.141	0.159
Higher	0.264	0.256
Total sample	0.164	0.103

**Table 2A. Annual variation of the experience returns by sector (%)**

	Unweighted rates	Weighted rates
Low intensity technology and extractive	0.145	0.135
Medium-low intensity technology	0.110	0.067
Medium-high or high intensity technology	0.144	0.093
Production and distribution of energy	0.172	0.130
Construction and hostelry	0.155	0.082
Trade	0.172	0.155
Transports and communications	0.168	0.047
Financial and bussines servicies	0.245	0.228
Total sample	0.164	0.103

**Table 3A. Annual variation of the experience returns by educational level and sector (%)**

	Unweighted rates	Weighted rates
Basic, low technology	0.052	0.067
Basic, medium technology	0.060	0.015
Basic, high technology	0.207	0.113
Medium, low technology	0.120	0.154
Medium, medium technology	0.130	0.182
Medium, high technology	0.189	0.210
High, low technology	0.243	0.250
High, medium technology	0.302	0.206
High, high technology	0.235	0.283